SECTION 16000 – ELECTRICAL SPECIFICATIONS

PART 1 – GENERAL

1.1 CODES AND REQUIREMENTS

A. All electrical work shall comply with the requirements of the applicable edition of the National Electrical Code, Local Building Code and as specified herein whichever is more strict.

B. The contractor shall comply with the requirements of the General Conditions, Supplemental General Conditions of the project specifications, all Contract Documents, and any base building specifications and building criteria included in this project.

C. Visit the premises before submitting bid as no extras will be allowed for lack of knowledge of existing conditions.

D. Drawings are diagrammatic in nature. Take all dimensions from Architectural drawings, certified equipment drawings, and from the structure itself before fabricating any work.

E. The drawings indicate the location, type and sizes of various utilities within the site where known. Any relocation or remodeling required must be approved by the Architect before proceeding. Investigate all utilities such as electric and telephone and make arrangements with the proper authority to pay for any charges associated with connecting those utilities. Pay for all permits, fees, inspections etc.

F. Good workmanship and appearance are considered equal to proper operation.

G. Provide all core drilling, channeling, cutting, patching, trenching and backfill as required for installation of electrical equipment. Seal holes, fireproofing where necessary, and refinish all repair work to original condition where damaged by electrical work.

H. Make provisions for safe delivery and secure storage of all materials.

I. Provide the Architect with a complete set of plans and specifications corrected to as-built conditions at the completion of the job.

1.2 WARRANTY

A. The electrical contractor shall provide for the owner a one-year (from the date of final acceptance) warranty of all electrical equipment and systems provided under this contract except for incandescent or fluorescent lamps. All defective equipment or materials which appear during the warranty period shall be replaced or repaired by the electrical contractor in a timely fashion.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. The contractor shall provide all equipment, accessories necessary whether specifically stated or not to make the required electrical systems complete and operational.

B. All equipment provided shall be new except as otherwise stated on the drawings. All equipment provided shall be U.L. listed when such standards exist for the type of equipment furnished and acceptable for installation by the Local Building Authority.

2.2 CONDUCTORS

A. Minimum size #12 AWG except for control circuits which may be #14 or signal circuits which shall be as indicated. All conductors shall be copper. Increase conductor size as necessary to limit branch circuit voltage drop to 3% and feeder voltage drop to 2%.

B. CT Scanner wiring shall comply with the following requirements:

1. All wires shall be stranded, flexible, thermo-plastic, color coded, copper only.
2. Wire shall be cut 10 foot long at outlet boxes, duct termination points or stubbed conduit ends, unless otherwise specified.
3. All conductors, power, signal and ground shall be run in conduit or duct system.
4. Wire runs must be continuous copper and free from splices.
5. Contractor shall ring out and tag all wires at both ends.
6. See GE Medical Systems drawings for additional information.

C. Splices for #8 and smaller conductors - wire or wing nuts.

D. Feeders and other wiring No. 4 AWG and larger, type THWN.

E. Other wiring No. 6 and smaller, type THWN.

F. Wiring in high temperature areas shall be rated 105°C and be a type accepted by local code.

G. Color Coding: Wiring for control systems to be installed in conjunction with mechanical and miscellaneous equipment shall be color coded in accordance with the wiring diagrams furnished with the equipment. Branch circuit wiring, including circuits to motors, and all feeders shall be coded by line or phase as follows:

Wire No. 2 AWG and smaller shall be factory color coded. Wire No. 1 AWG and larger may be color coded by field painting or color taping of six inch (6") length of exposed ends.

120/208 Volts Color Codes
A = Black
B = Red
C = Blue
Neutral = White
Ground = Green
Switch Travelers = Pink

2.3 OUTLETS

A. 4" square or octagonal, zinc coated sheet steel boxes.

B. Provide 3/8" no-bolt fixture studs.

C. Provide covers set to come flush with finish walls.

D. Utility or sectional switch boxes only where permitted.

E. Communications outlets shall be comprised of 4" square box, single gang plaster ring and blank device plate. Provide (1) ¾"c to above accessible ceiling.

2.4 DEVICES

A. All devices shall be ivory color.
   1. Hospital grade receptacles, Hubbell HBL8300 series.

   2. A.C. quiet operating type switches equal to Hubbell 1200-I Series.

B. Device plates shall be satin stainless steel, as manufactured by Sierra, or match finish of existing devices.

C. Mount devices in accordance with the following schedule except where otherwise noted on the drawings:
   1. Convenience Receptacles
      Short Axis Horizontal, ground prong up 1'-6" A.F.F.*
   2. Light Switches - Latch Side of Door 4'-0" A.F.F.
   3. Telephone Outlets 1'-6" A.F.F.*

   * Except in areas with counters, baseboard heaters or in areas of block or brick construction.

2.5 LIGHTING FIXTURES

A. Provide all new lighting fixtures complete with lamps, ballasts, reflectors, plaster frames, louvers, stem hangers, etc., and as described on the drawings.

B. All ballasts shall be electronic, less than 20% THD, internally protected by use of two internal, temperature-sensitive, non-resetting protectors, Class "P".

C. Exit lights shall conform with local code requirements.

D. Mount all outlets at position and height to clear ducts, etc.

E. Acrylic lenses shall be 100% virgin materials and 0.125 inch thick minimum unpenetrated thickness shall be 0.035 inch.

2.6 DISTRIBUTION AND BRANCH CIRCUIT PANELBOARDS

A. Provide dead-front, circuit breaker type panels, with the size and number of branches indicated. Breakers shall be thermal magnetic type (bolted) employing quick-make and quick-break mechanisms for manual operation as well as automatic operation. Automatic tripping shall be indicated by the breaker handle assuming a distinctive position from the manual "on" and "off". Multiple breakers shall have a common trip. Tie handles will not be permitted.

B. Panelboards having branch circuit breaker sizes 15 to 100 amperes shall be General Electric "AQ" for operation on 120/208V. systems.

C. Panelboards may contain two (2) subfeed breakers having a rating in excess of 100 amperes, but less than 225 amperes.

D. Panelboards having more than two (2) branch circuit breakers rated in excess of 100 amperes shall be General Electric "CCB".

E. All spaces shall be fully equipped.

F. Panelboards shall have a grounding lug for the equipment grounding system.

G. Circuit breakers shall have a minimum interrupting capacity as follows:
120/208 volts: 22,000 amperes.

H. Panelboards shall be a minimum twenty inches (20") wide (box).

I. All buses shall be aluminum.

J. The above panelboard designations are General Electric; however provide any of the following equipment, or as accepted:

	120/208V	Sub-distribution type
Cutler Hammer	CHB	MP-40
General Electric	AQ	CCB
I.T.E.	CDP-7	CDP-6
Square-D	NQOB	I-Line
Westinghouse	WEB	CDP

2.7 SAFETY AND DISCONNECT SWITCHES

A. Provide enclosed, fusible or nonfusible safety switches where indicated and herein specified. Safety switches shall bear the UL label and each enclosure shall be the NEMA type suitable for the surrounding area and conditions. Switches shall be minimum normal duty, horsepower rated, and shall have quick-make and quick-break mechanisms. Switches used on motor circuits shall have adequate horsepower ratings for the motors served.

1. Safety switches employed as motor disconnect devices for two (2) or more loads shall be of the fusible type for rejection type fuses.

2. Switches shall be as manufactured by Cutler-Hammer, General Electric, I.T.E., Square-D, Westinghouse, or as accepted, and all switches provided shall be by the same manufacturer.

2.8 FUSES

A. Fuses shall be as manufactured by Bussmann unless noted otherwise on the drawings.

B. Fuses for application at under 600 volts, and rated at 600 amps or less, shall be as follows:

1. For all fuses in the main service, equipment, except for motor circuits, provide current limiting, 200,000 rms amperes symmetrical interrupting capacity, rejection type, Bussmann Limitron or as accepted.
2. For all other fuses, provide rejection type with 200,000 rms amperes symmetrical interrupting capacity, Bussmann "Fusetron", or as accepted.

C. Control Fuses shall be Bussmann one-time nonrenewable fuses.

2.9 DRY-TYPE TRANSFORMERS

A. Provide dry-type transformers to obtain 277/480-V power. Transformers shall be as manufactured by Eaton Corp.; Cutler-Hammer, General Electric Co., Siemens Energy and Automation, Inc. (ITE), Square D Co., MGM, or Controlled Power.

B. Enclosure: NEMA type suitable for the surrounding area and conditions.

PART 3 - EXECUTION

3.1 CONDUIT/RACEWAYS

A. All conductors shall be enclosed by conduit sized in accordance with Table 3C of the National Electrical Code. Minimum 1/2" except for factory furnished lighting fixture flexible conduit may be 3/8".
1. Galvanized rigid conduit (GRC) and intermediate metal conduit (IMC) shall be used for above and below grade applications in accordance with articles 345, 346 of the National Electrical Code. All couplings shall be threaded.

2. Rigid nonmetallic conduit (PVC) Schedule 40 shall be permitted for below grade or concrete cast in place applications above grade. All elbow transitions to above grade or stub-out of floor slab shall be asphalt coated rigid conduit. Provide equipment grounding conductor for all runs of rigid nonmetallic conduit.

3. Electrical metallic tubing (EMT) shall be utilized for all dry, above grade or above floor applications in accordance with article 348 of the National Electrical Code. Couplings shall be steel compression type made up wrench-tight.

4. Flexible metal conduit shall be utilized for all connections to vibrating equipment such as motors (minimum of 2'-0" - maximum of 6'-0"), connection to lay-in type light fixtures or in remodel areas specifically noted for "fishing" in existing walls or non-accessible ceilings.

5. Surface metallic raceways shall be used only in areas specifically noted and of size and type specified on the drawings.

B. All exposed conduit (including conduit installed in ceiling plenums) shall be routed parallel or perpendicular with the building walls. Support conduit as required by the National Electrical Code.

C. Provide expansion type fittings for all conduits which cross expansion joints.

3.2 IDENTIFICATION

A. Receptacles: Identify panelboard and circuit number from which served. Use machine-printed, pressure-sensitive, self-adhesive, abrasion-resistant label tape on faceplate of outlet boxes.

3.3 GROUNDING

A. Service equipment, conduit systems, supports, cabinets, equipment, transformers, fixtures, the grounded circuit conductor, etc., shall be properly grounded in accordance with the latest issue of the National Electrical Code. Provide all bonding jumpers and wire, grounding bushings, clamps, etc., as required for complete grounding. Route ground conductors to provide the shortest and most direct path to the ground electrode system. Ground connections shall have clean contact surfaces, tinned and sweated while bolting. Install all ground conductors in conduit.

3.4 PANELBOARDS

A. Install panelboards with the top of the trim six-feet, three-inches (6'-3") from the finished floor.

B. Field check all panelboard loading and reconnect circuits as required to provide balanced phase and line loads.

3.5 MECHANICAL EQUIPMENT WIRING AND CONNECTIONS

A. Mechanical equipment motors and controls furnished with mechanical equipment.

B. Provide feeder circuits to mechanical equipment and make all connections.

C. Provide safety switches and/or thermal overload switches as required.

D. Provide all power (line voltage) wiring for mechanical equipment and make all connections except for temperature control equipment, which will be wired by mechanical contractor.

E. Furnish, set in place, and wire, except as indicated, all heating, ventilating, air conditioning, plumbing, fire protection, motors and controls in accordance with the following schedule. Carefully coordinate with work performed under the Mechanical Division of these specifications.

ITEM	FURNISHED UNDER	SET IN PLACE OR MOUNTED UNDER	POWER WIRING	CONTROL WIRING
Equipment Motors and Thermal overloads, resistance heaters.	MD	MD	ED	-
Motor Controller; magnetic starters, reduced voltage starters and overload relays.	MD(1)	ED(1)	ED	-
Disconnect switches, fused or unfused, H.P. rated switches, thermal overload switched and fuses, and manual operating switches.	ED(1)	ED(1)	ED	-
Pushbutton stations, pilot lights, multi-speed switches, float switches, thermostats, control relays, control panels, interlocks and boiler controls.	MD	MD(2)	ED	MD(2)
Contactors, 120V control circuit outlets for control panels and for boiler controls.	ED	ED	ED	MD
Smoke Detectors (Duct Mounted).	ED	MD	ED	MD(3)
Fire/Smoke dampers, Smoke Dampers.	MD	MD	ED	MD(3)

1) If furnished as part of factory wired equipment, power wiring and connections by ED.

2) If float switches, line thermostats, P.E. switches, time switches, etc., carry the FULL LOAD CURRENT to any device they shall be furnished and set in place by MD, but shall be connected by ED. If they do not carry the FULL LOAD CURRENT to any device they shall be furnished, set in place and wired by MD. Control devices carrying full load current furnished by MD and wired by ED shall be located at the device being controlled, unless shown otherwise on the drawings or mutual agreement is made between the contractors with no change in the contract price.

3) Wiring from fire alarm electrical contacts to fire alarm system control panel by ED; all mechanical equipment control function wiring by MD. ED to coordinate locations of electrical contacts with MD. MD to coordinate locations of duct smoke detectors with ED.

F. Heater units in all motor starters shall be sized for approximately one hundred fifteen percent (115%) of full load motor current. Check and coordinate all thermal protective devices with the equipment they protect.
   1. Provide for each motor, one-half (1/2) horsepower and below, a horsepower rated disconnect switch and thermal overload protection unless integrally provided with the motor. Thermal overload switches for single phase motors shall be Allen-Bradley Bulletin 600 or acceptable. Size heater units for approximately one- hundred fifteen percent (115%) of full load motor current.

   2. Miscellaneous Equipment: Where outlets are indicated for miscellaneous equipment requiring electric power or control, provide wire, conduit, etc., and make all connections, unless otherwise indicated.

3.2 TELEPHONE/DATA SYSTEMS

A. Provide conduits and outlets as indicated. Provide #14 AWG pull wire for all empty conduit.

B. Outlets shall consist of 4" square box with bushed opening in plate. Plates shall match finish of other plates. Provide 3/4” conduit from j-box to above accessible ceiling and provide bushing.

3.3 SPECIAL SYSTEMS

A. Provide all special systems as specified on the drawings including all required accessories to make the system complete and operational. All special systems shall be installed and connected in accordance with the manufacturer's specifications. Provide final testing of systems.

END OF SECTION